



22066008

**BIOLOGY
HIGHER LEVEL
PAPER 2**

Thursday 4 May 2006 (afternoon)

2 hours 15 minutes

Candidate session number

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INSTRUCTIONS TO CANDIDATES

- Write your session number in the box above.
- Do not open this examination paper until instructed to do so.
- Section A: answer all of Section A in the spaces provided.
- Section B: answer two questions from Section B. Write your answers on answer sheets. Write your session number on each answer sheet, and attach them to this examination paper and your cover sheet using the tag provided.
- At the end of the examination, indicate the numbers of the questions answered in the candidate box on your cover sheet and indicate the number of sheets used in the appropriate box on your cover sheet.

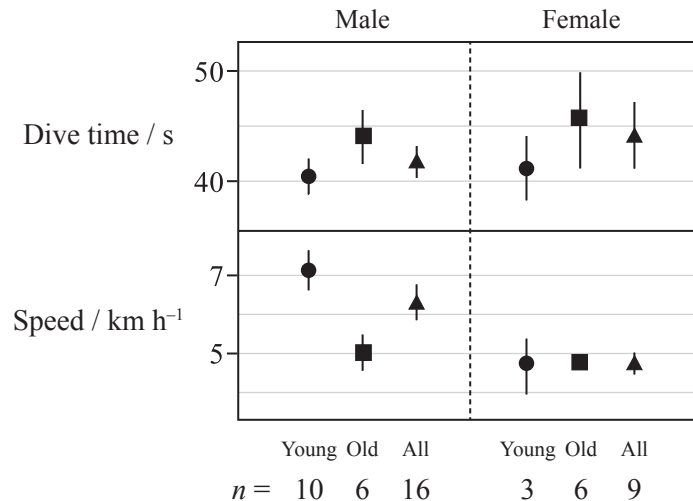


SECTION A

Answer **all** the questions in the spaces provided.

1. Killer whales (*Orcinus orca*) live off the west coast of Canada. The different behaviours of 25 whales were observed and classified by age and sex. Figure 1 below shows the relationship between gender and age with whale behaviour.

Figure 1



[Source: R Williams *et al*, (2002), *Journal of Zoology*, **256**, page 260]

- (a) Identify which age group of female killer whales dive for longer periods of time. [1]

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- (b) (i) Compare the killer whale behaviour in young and old males. [2]

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- (ii) Calculate the difference in speed between all the male and all the female killer whales. [1]

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(Question 1 continued)

- (c) If killer whales dive for a long period of time, lactate builds up in their muscles. Explain why this occurs. [3]

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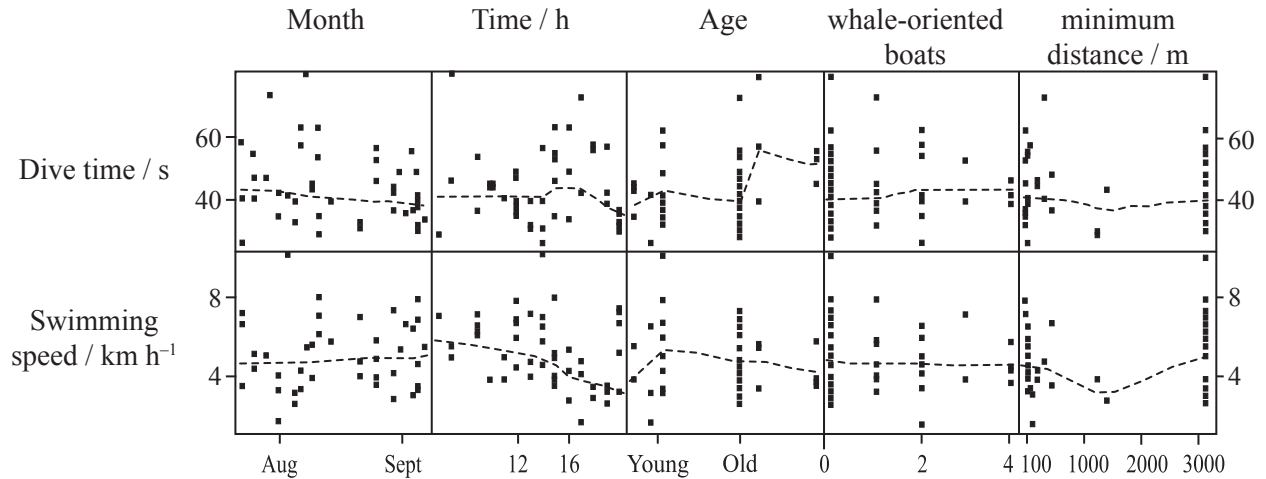
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(Question 1 continued)

Whale-watching boats are requested to stay more than 100 m away from the killer whales. A study was conducted to see the possible effects of boats on the killer whales. Data presented in figure 2 below shows relationships between different variables and the behaviour of female killer whales: months, time of day, age of whales, numbers of whale-oriented boats (ecotourism) and the minimum distance of the boats from the killer whales. The dotted line in each graph represents the mean.

Figure 2



[Source: R Williams *et al*, (2002), *Journal of Zoology*, **256**, page 265]

- (d) Describe the relationships between the months of August and September as well as the time of day in the behaviour of the female killer whales. [2]

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- (e) Compare the effects of age in figure 1 for female killer whales with those in figure 2 for both dive time and swimming speed. [2]

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(Question 1 continued)

- (f) Evaluate this data in terms of whale-watching ecotourism and its possible effects on female killer whale behaviour. [3]

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- (g) Suggest **two** other studies that could further assess the influence of ecotourism on killer whale behaviour. [2]

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2. (a) A farmer has rabbits with two particular traits, each controlled by a separate gene. Coat color brown is completely dominant to white. Tailed is completely dominant to tail-less. A brown, tailed male rabbit that is heterozygous at both loci is crossed with a white, tail-less female rabbit. A large number of offspring is produced with only two phenotypes: brown and tailed, white and tail-less, and the two types are in equal numbers.

- (i) Deduce the pattern of inheritance of these traits. [2]

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- (ii) State both parents' genotypes and the gametes that are produced by each during the process of meiosis. [2]

Male genotype:

Female genotype:

Male gametes:

Female gametes:

- (iii) Predict the genotypic and phenotypic ratios of the F₂ generation. Show your working. [2]

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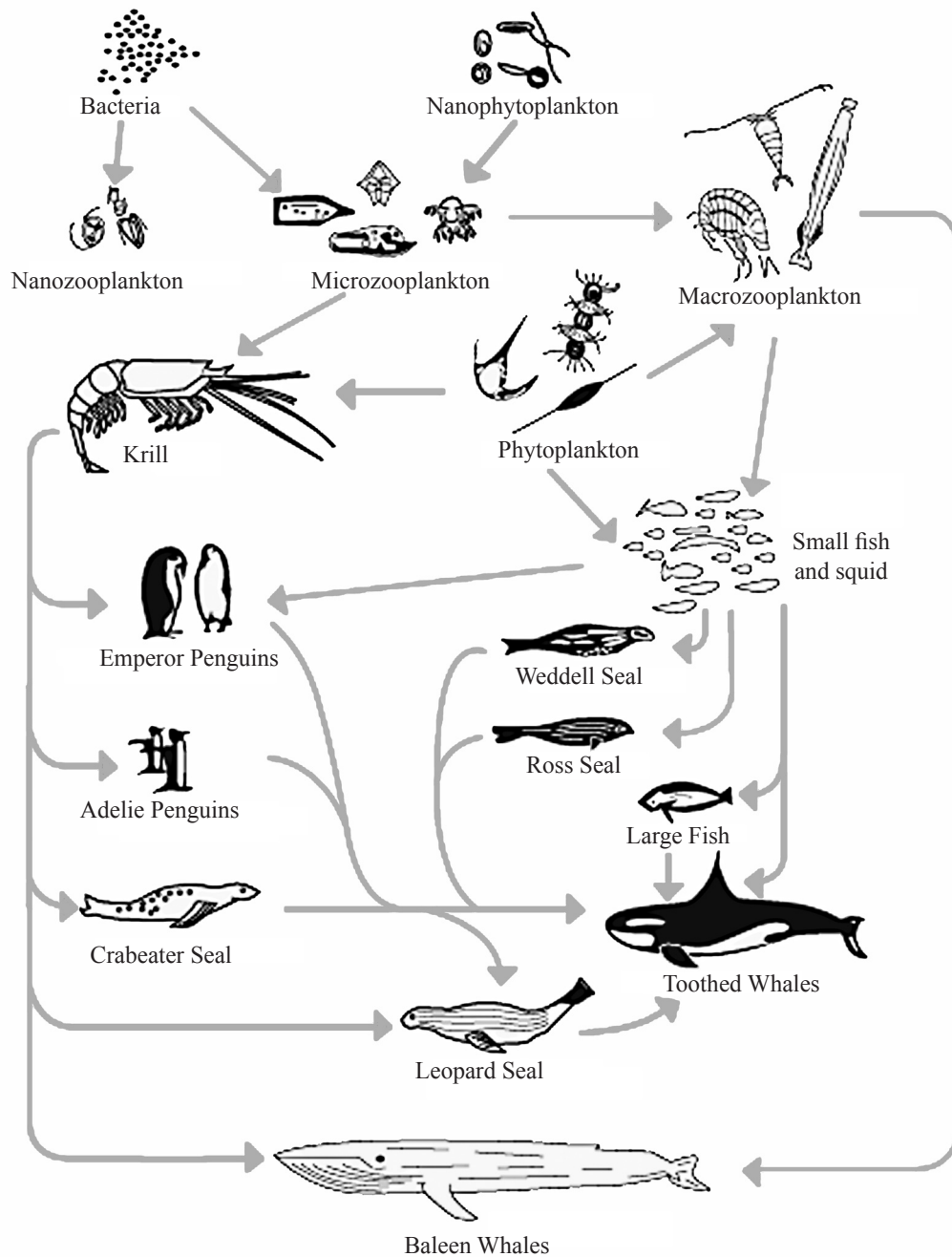
- (b) Outline the biotechnology used to transfer genes from one organism to another. [3]

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3. The diagram below shows an ocean food web. The arrows indicate the energy flow.



[Source: www.ciesin.org/docs/011-558/fig4-3.gif]

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(Question 3 continued)

- (a) Indicate the **three** producers of this food web. [1]

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- (b) Identify the trophic level of each organism named below. On the diagram opposite, mark clearly the arrows of energy flow that support your choice.

- (i) Macrozooplankton [1]

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- (ii) Weddell seal [1]

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- (c) Determine the maximum percentage of energy that may reach emperor penguins from primary producers. [1]

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- (d) Explain the possible effects of natural selection within the food web if conditions allowed for a sudden increase in the small fish populations. [3]

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SECTION B

*Answer **two** questions. Up to two additional marks are available for the construction of your answers. Write your answers on the answer sheets provided. Write your session number on each answer sheet, and attach them to this examination paper and your cover sheet using the tag provided.*

4. (a) Using a table, compare the structures of prokaryotic and eukaryotic cells. [5]
- (b) Identify **one** specific disease in humans caused by a prokaryotic pathogen, name the pathogen and outline its mode of transmission and its possible effects. [5]
- (c) Explain the production of antibodies against a pathogen. [8]
5. (a) Outline the structure of DNA. [5]
- (b) Describe the effects of polygenic inheritance using two specific examples. [5]
- (c) Explain the process of transcription in eukaryotes. [8]
6. (a) Outline the formation of carbohydrate molecules in photosynthesis starting from the absorption of light energy. [6]
- (b) Describe the metabolic events during germination of an angiosperm seed that is rich in starch. [4]
- (c) Explain the formation of ATP by chemiosmosis in cellular respiration. [8]
7. (a) Outline the regulation of pregnancy by two named hormones. [4]
- (b) Describe the principles of synaptic transmission in the nervous system. [6]
- (c) Explain homeostasis giving **two** specific examples that show the role of the endocrine **or** the nervous system. [8]
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